Appendix B
Advantages and Disadvantages of Various Beach Stabilization Structures

B-1. Groins

a. Advantages.

(1) Groins are effective against erosion caused by sand losses due to longshore transport.

(2) A wealth of data is available on the performance of groins in various physical environments.

(3) Groins can be built using shore-based equipment and are therefore often less expensive to construct.

(4) Groins do not change the character of the surf zone. Wave heights along a beach after groin construction are virtually unchanged.

(5) Groins can be constructed of various types of materials, e.g., rubble-mound, steel, and concrete sheet piling, timber, etc.

(6) By adjusting their dimensions and permeability, groins can be designed to either completely block longshore transport along the beach face or to allow sand bypassing.

b. Disadvantages.

(1) Groins are not effective in preventing offshore sand losses.

(2) Groins can cause rip currents to develop along their flanks and thus might enhance offshore sand loss.

(3) Groins may starve downdrift beaches of sand if they do not allow bypassing.

(4) There is a range of conflicting design philosophies: permeable versus sand tight; high versus low; long versus short, etc.

B-2. Detached breakwaters

b. Advantages.

(1) Detached breakwaters are effective against erosion caused by both alongshore and offshore sand losses.

(2) Detached breakwaters have been proven to stabilize shorelines.

(3) Detached breakwaters are often aesthetically acceptable when other shore stabilization structures are not. (They can be designed to be submerged over most of a tidal cycle.)

(4) They can be built of inexpensive, readily available materials, e.g., rubble-mound, dumped stone, etc.

(5) They can be built to allow sand bypassing and control the rate of bypassing.

(6) They can be designed to permit overtopping to improve water quality in the breakwater's lee.

(7) There is extensive foreign experience in using nearshore breakwaters for shoreline stabilization.

(8) Nearshore breakwaters can significantly reduce wave heights along a reach of shoreline.

b. Disadvantages.

(1) Detached breakwaters may be expensive to construct because they are not connected to shore and may require either temporary structures or floating plant to support construction equipment.

(2) Breakwaters significantly alter the character of the surf zone and may restrict certain beach activities, e.g. bathing in the vicinity of the structures, surfing, etc.

(3) They may pose a navigation hazard and may require the installation and continued maintenance of aids to navigation.

(4) They may pose a hazard to swimmers.

(5) If improperly designed, they could cause water quality problems due to poor circulation behind them.

(6) There has not been extensive experience in using nearshore breakwaters for shoreline stabilization in the United States.

(7) Detached breakwaters may connect with shore by forming a tombolo. This could seriously interrupt longshore transport and cause downdrift erosion.

B-3. Artificial Headlands

a. Advantages.

(1) The installation of artificial headlands or headland breakwaters can produce a stable shoreline similar to the stable pocket beaches observed with natural headlands.

(2) Although a relatively new practice, it has been applied successfully in numerous countries.

b. Disadvantages. Downdrift effects with headlands can be significant and continuing.

B-4. Submerged Sills

a. Advantages.

(1) Submerged sills (perched beaches) may be more aesthetically acceptable than groins or breakwaters because they are usually submerged and not visible from shore.

(2) Submerged sills reduce the level of wave action on a beach.

(3) They slow/retard offshore sand losses from a beach.

b. Disadvantages.

(1) The low sill structure may not be high enough to significantly reduce wave action and may not retard offshore losses.

(2) The submerged sill may prevent beach recovery during beach-building wave conditions.

(3) Submerged perched beach structures may pose a hazard to navigation.

(4) There has not been much experience with submerged sills/perched beaches; therefore, there are not much data upon which to base a design.

(5) It may be difficult and expensive to build the sill structure because it is both offshore and submerged. Construction may require floating plant and thus may be expensive.

(6) The submerged sill may be difficult to inspect since it is underwater.

B-5. Alternative Shoreline Stabilization Devices and Methods

a. Advantages.

(1) Alternative shoreline stabilization devices and methods may have the potential of being more effective and cheaper than traditional shoreline stabilization methods.

(2) They could be proposed and built as experimental projects and subsequently modified as needed to gain experience.

b. Disadvantages.

(1) Most alternative shoreline stabilization methods are virtually untried, and there is little information available on their performance; consequently, there is little information on which to base a design.

(2) A costly, major experimental/developmental program would have to be undertaken to obtain information on which to base a design. This might involve both laboratory and prototype studies.

(3) Operations and maintenance costs are unknown because of the lack of long-term experience.

(4) An alternative shoreline stabilization method, like any stabilization system, would have to be justified economically by the savings realized through increasing the time between periodic renourishments. Data to economically justify alternative methods are generally not available.